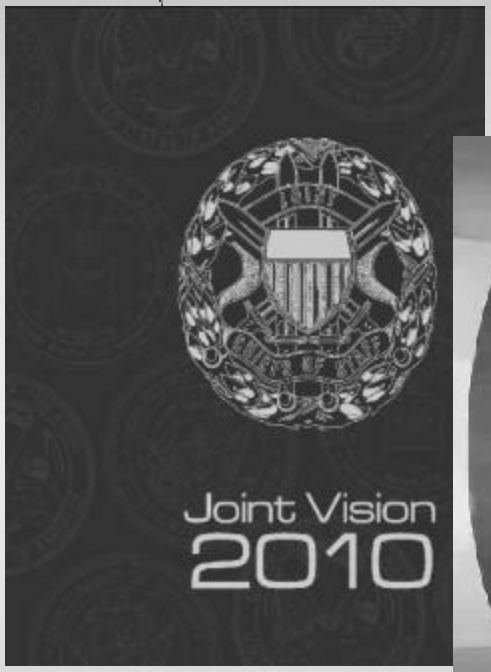
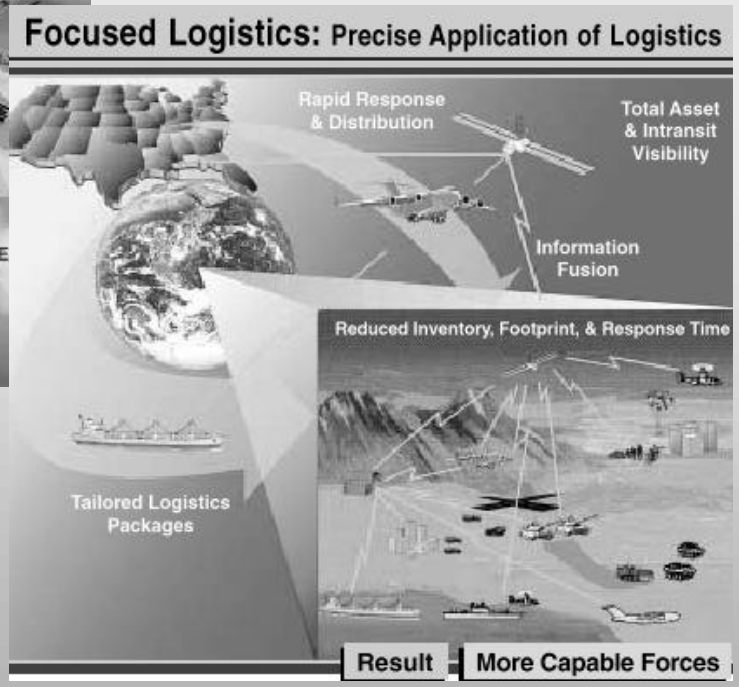
Interoperability and Logistics Life-Cycle Management through Open System Agent Technologies

NDIA Systems Engineering & Supportability Conference

October 2000

Answering the Challenge



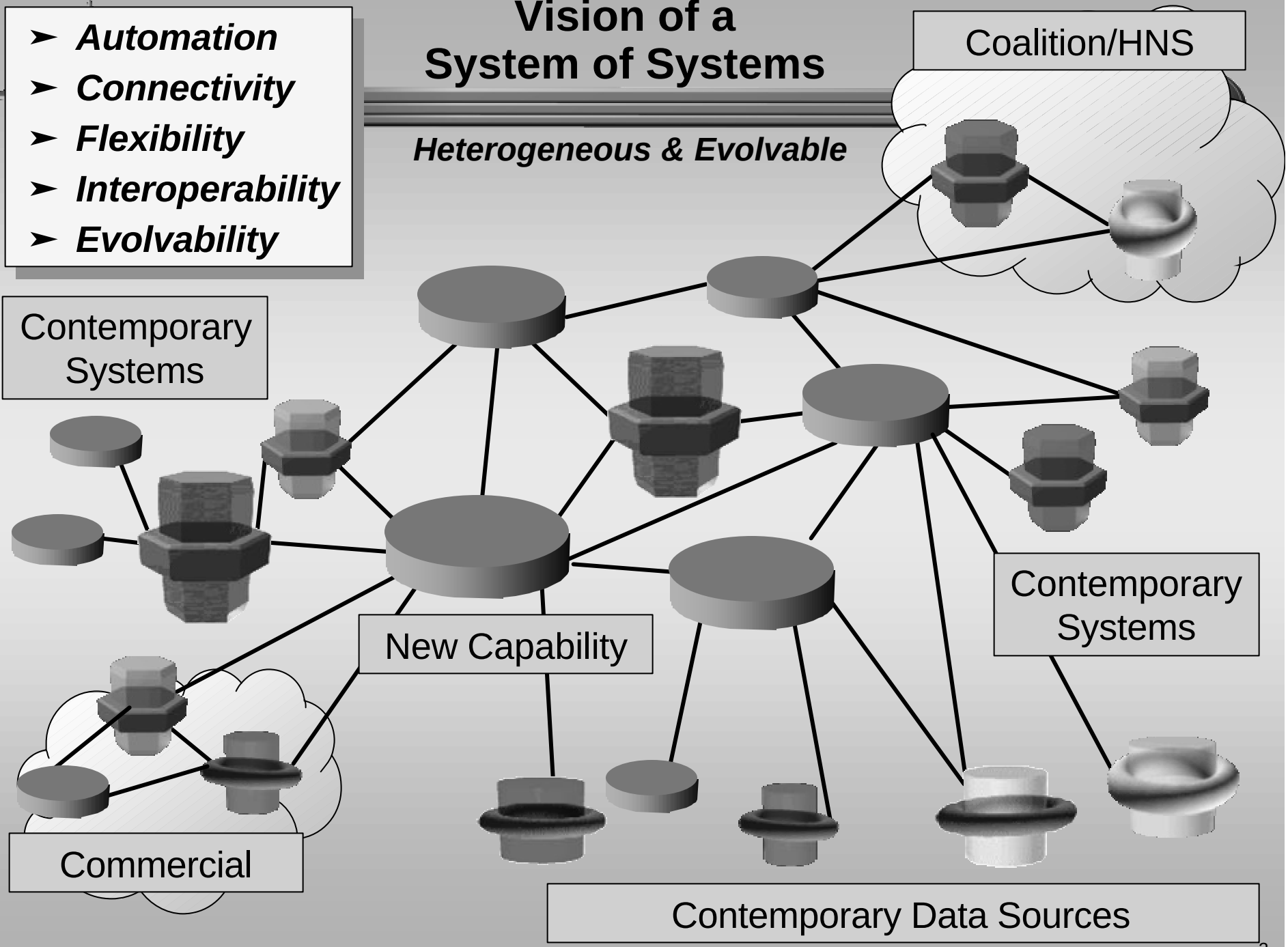


- **Must be able to fuse operations, intelligence and logistics.**
- **Must be able to interoperate our 1000+ critical logistics systems.**

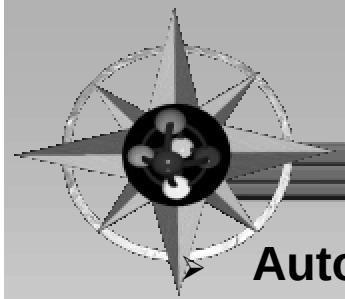
Vision of a System of Systems

- ***Automation***
- ***Connectivity***
- ***Flexibility***
- ***Interoperability***
- ***Evolvability***

Heterogeneous & Evolvable



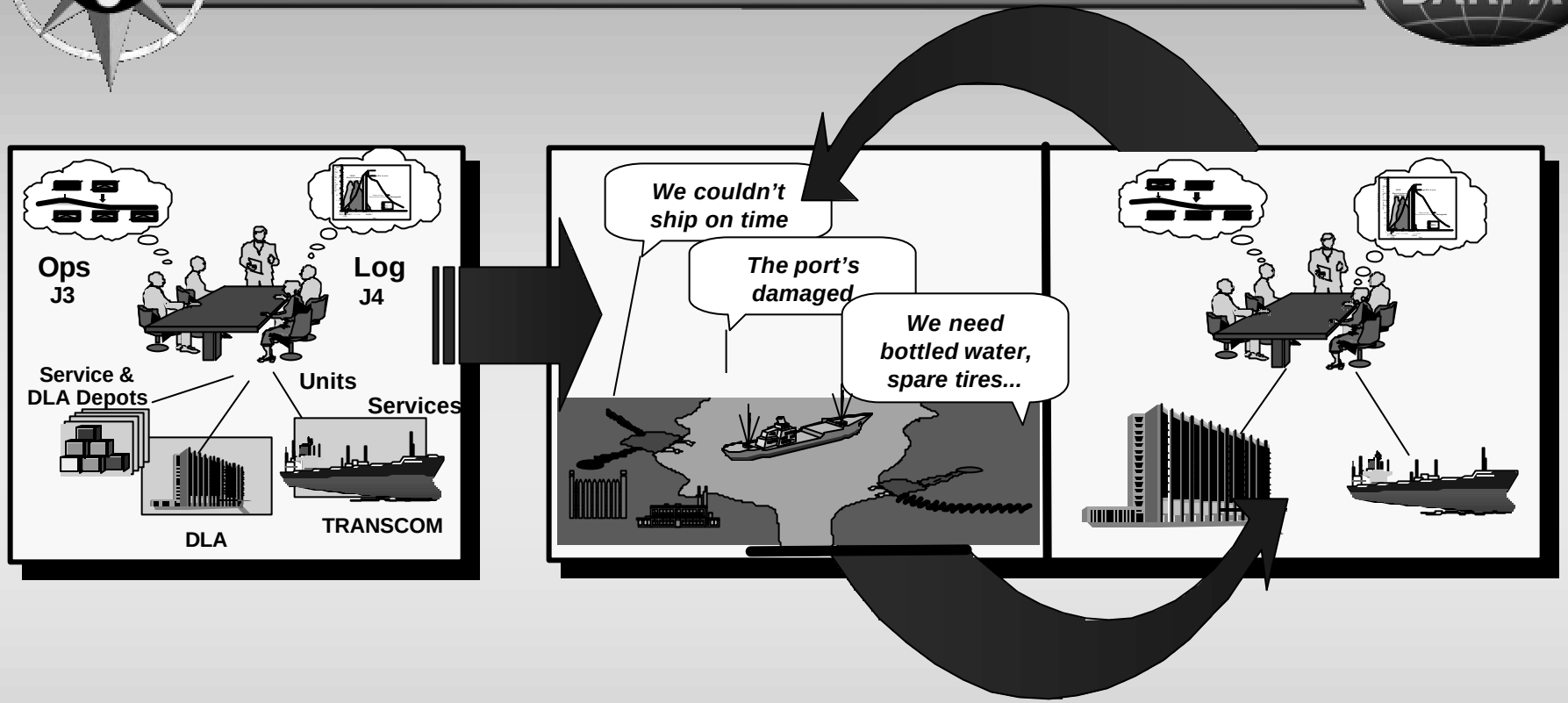
The Power of Software Agents



- **Autonomous:** Capable of operating independent of user interaction
- **Adaptive / Learning:** Capable of self-adjusting rules or behaviors
- **Mobile:** Capable of migrating from one environment to another
- **Persistent:** Capable of existing beyond any interactive session
- **Goal Oriented:** Capable of deriving tasks from goals and situations
- **Communicative / Collaborative:** Capable of working with other agents and services in a coordinated fashion
- **Flexible:** Resilient to change and failure during interactions with other agents/system or environment
- **Active / Proactive:** Capable of initiating actions based on observations, events or external situations

For all of these reasons, agent technology is fast becoming the design approach of choice - agents are coming…

Vision of Continuous Planning & Execution



Rapid Planning

- *All Echelons*
- *Executable detail*
- *Globally optimize*

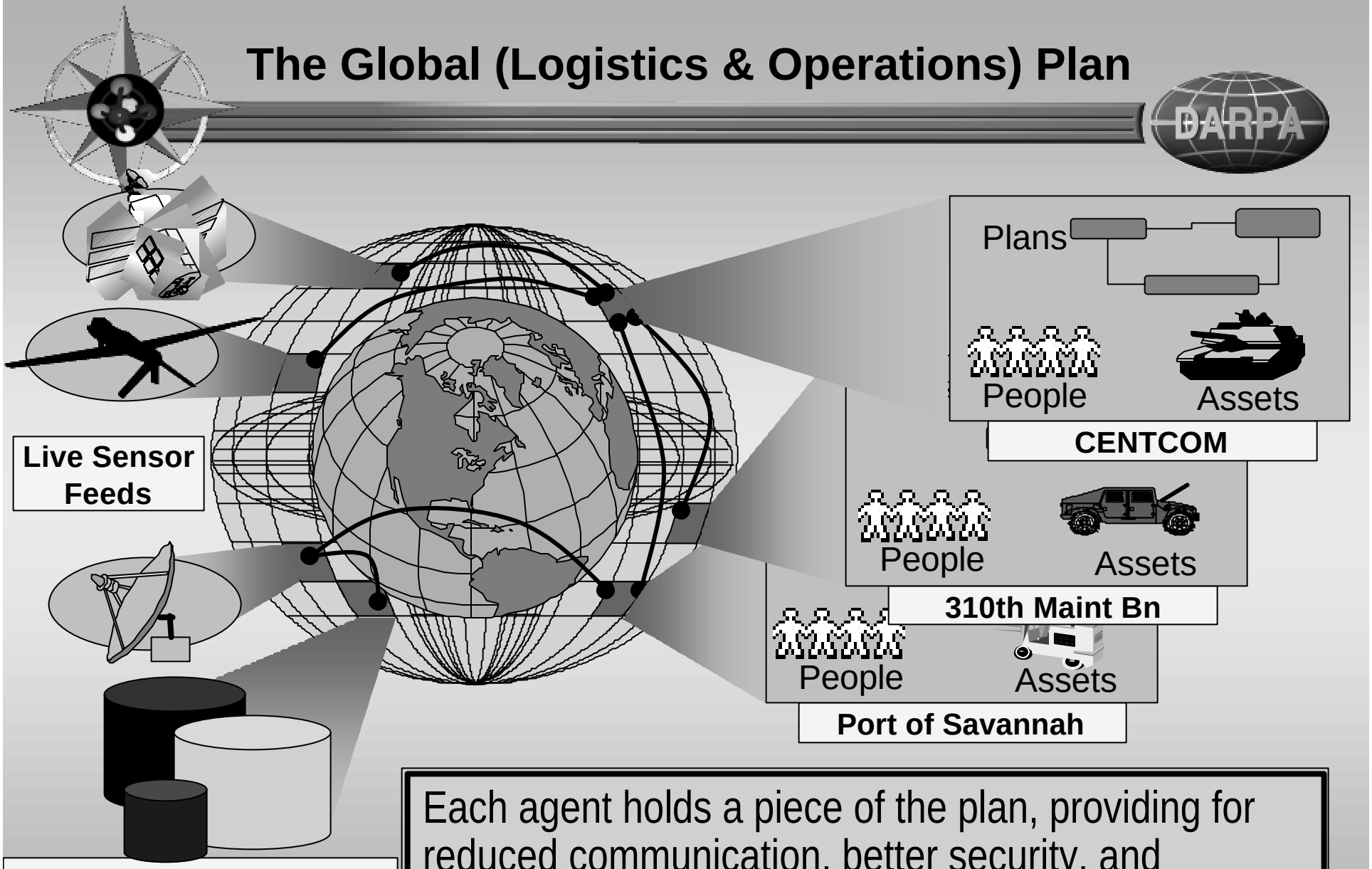
Execution Monitoring

- *Manage flow*
- *Deploy plan sentinels*
- *Localize problems*

Continuous Replanning

- *Redirected flow*
- *Localized Replanning*
- *Locally optimal fixes*

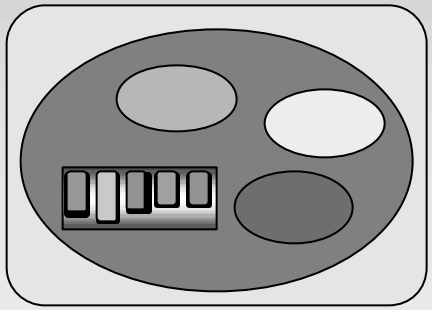
The Global (Logistics & Operations) Plan



Each agent holds a piece of the plan, providing for reduced communication, better security, and autonomous operations in the case of network outage.

Creating an ALP Agent

General Purpose Agent Architecture Cluster



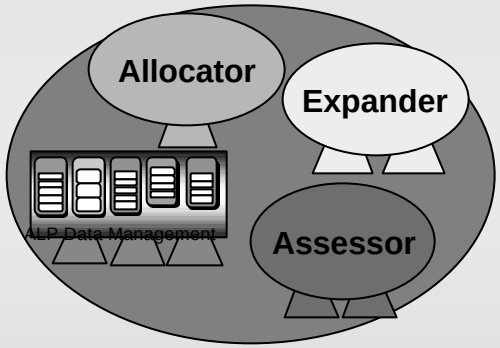
Cluster

+

Domain Knowledge and Business Rules / Processes

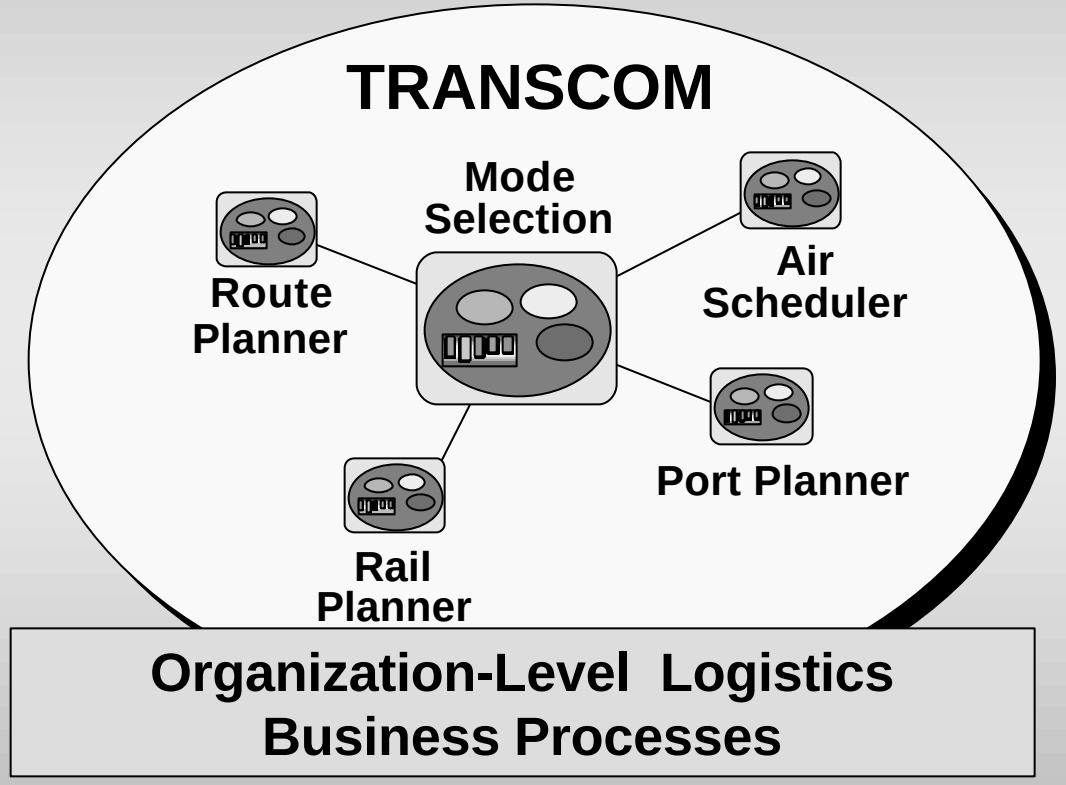
- PlugIn — Rules for expanding air transport tasks into mission legs
- PlugIn — Coordinates with carriers on costs and itinerary legs
- PlugIn — Monitors weather and flight status
- PlugIn — Schema translation to access GDSS and GTN

Domain Specific Agent



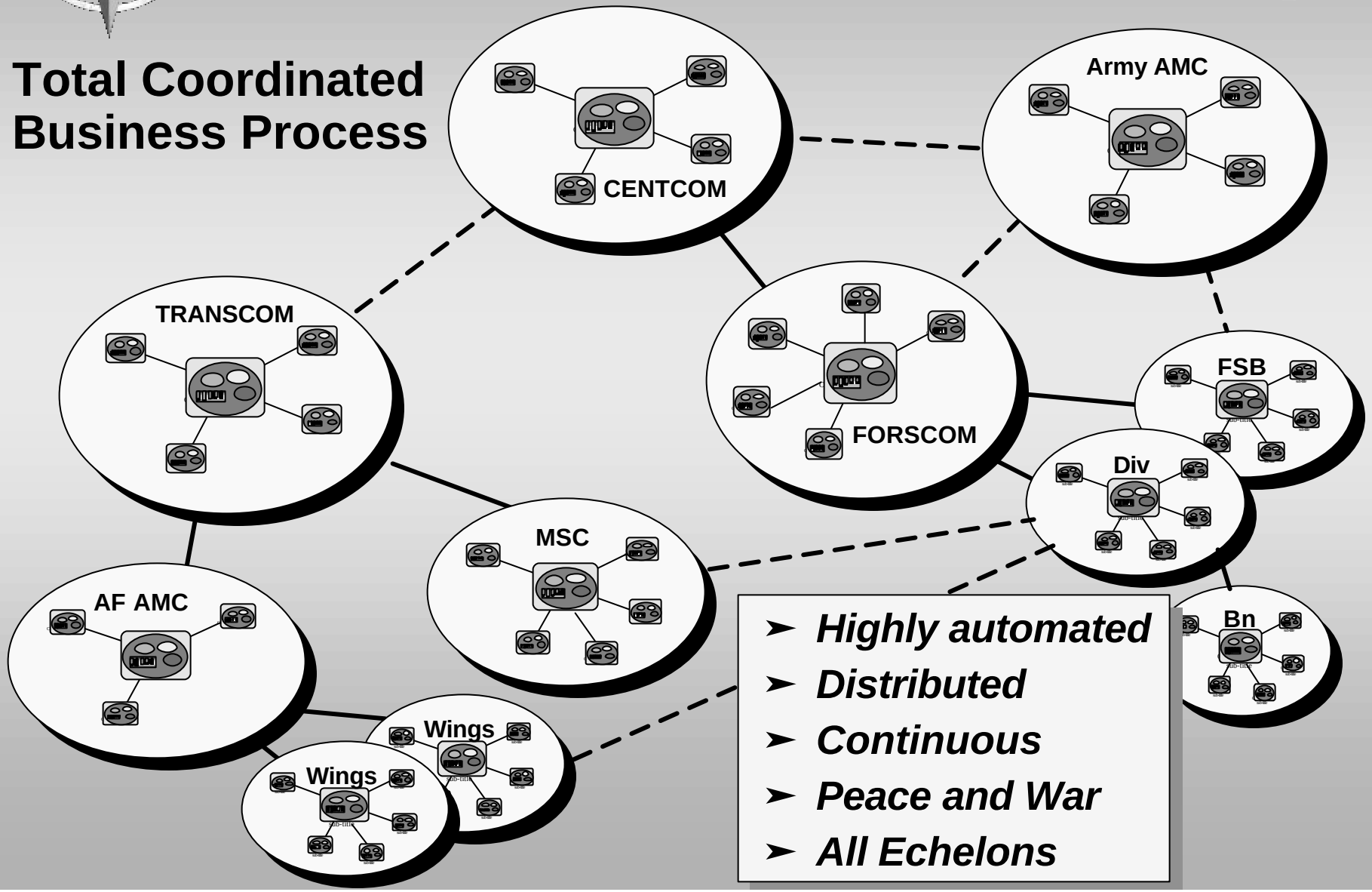
Air Scheduler Agent

Building Communities



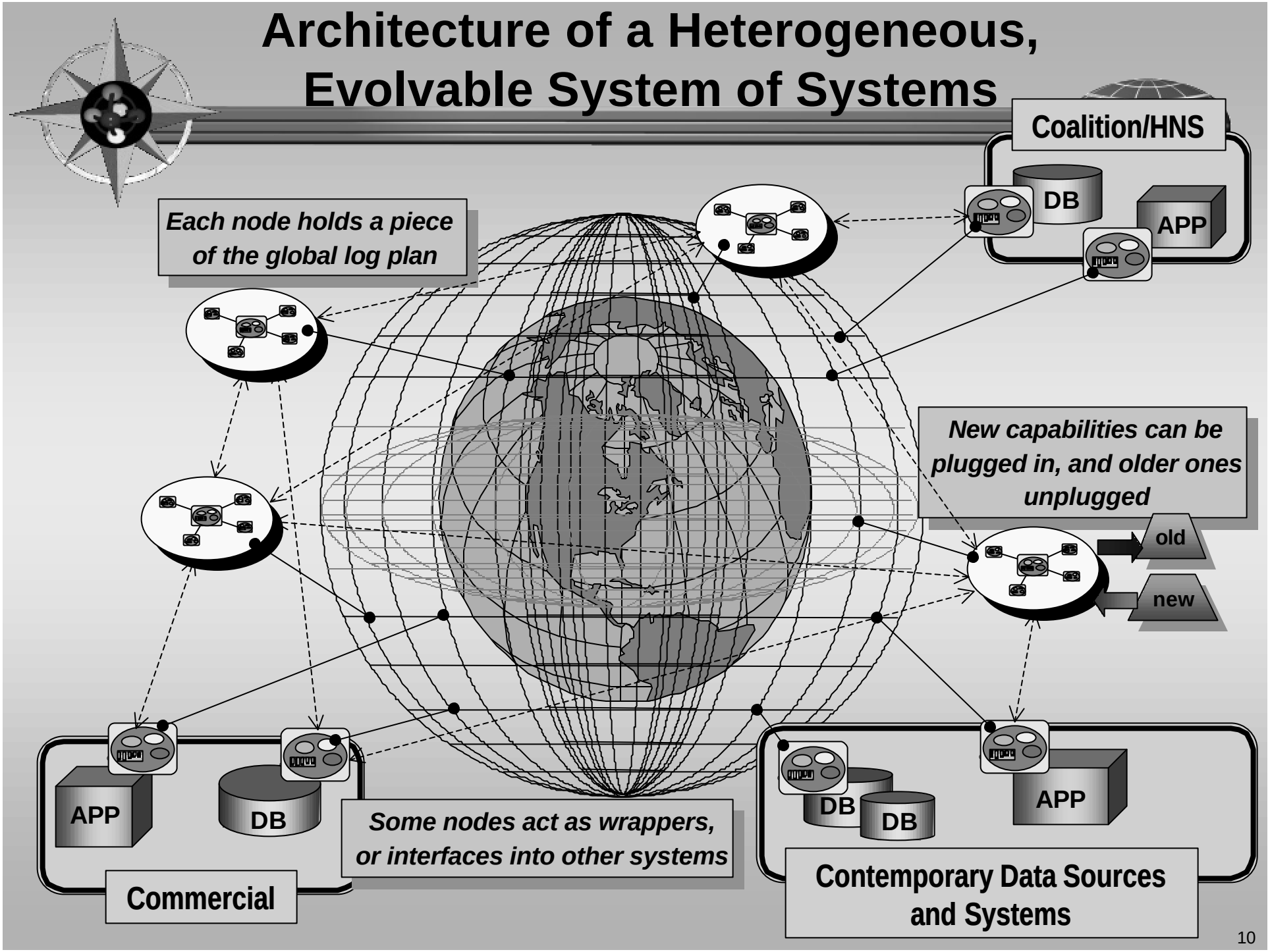
Building Societies

Total Coordinated Business Process



- ***Highly automated***
- ***Distributed***
- ***Continuous***
- ***Peace and War***
- ***All Echelons***

Architecture of a Heterogeneous, Evolvable System of Systems



Achieving Focused Logistics

Objective

Getting Control of the Logistics Pipeline...

- Planning, Managing, and Providing Visibility
- All Echelons, All Phases of Operations
- Continuous Planning and Execution

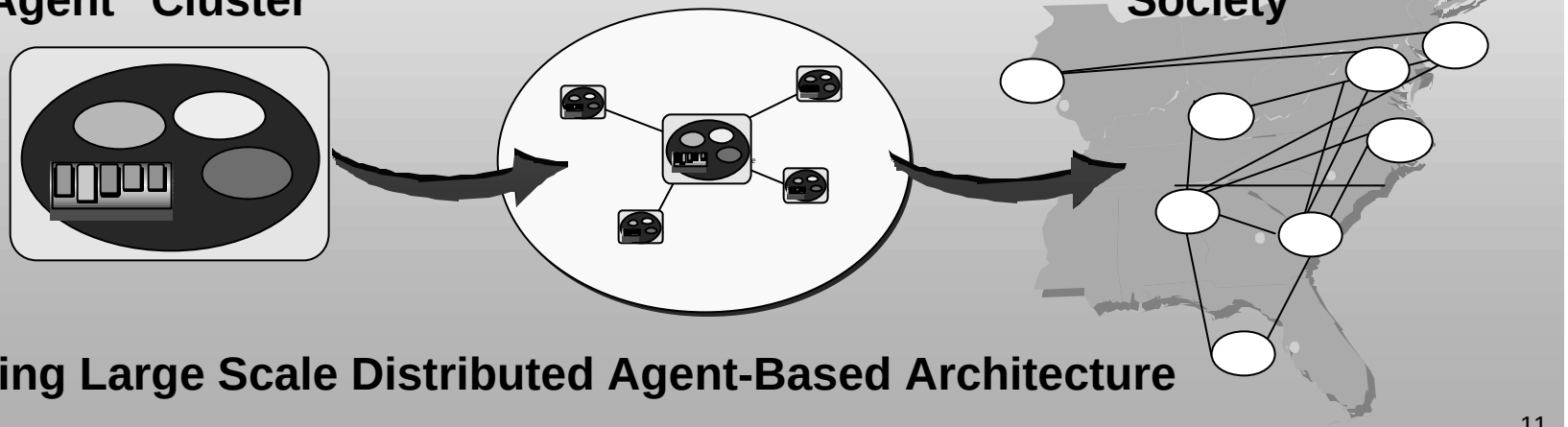
In-Storage | In-Process | In-Transit

Approach

Basic Building Block Agent "Cluster"

Agent Community

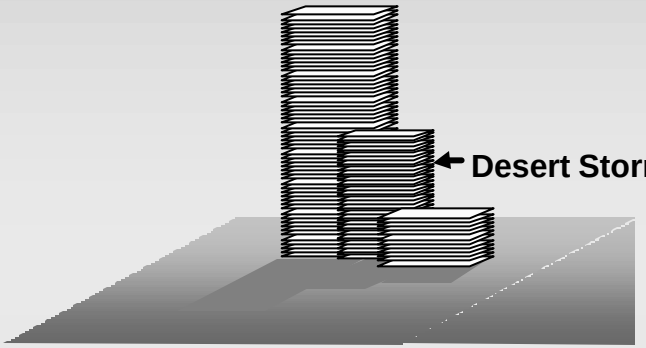
Complex Agent Society



Using Large Scale Distributed Agent-Based Architecture

To Achieve Focused Logistics

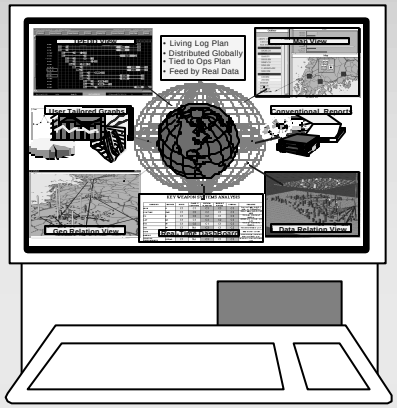
OLD WAY
Planning for Execution



- Sequential phases
- Manually intensive
- Takes days to months to complete
- Based on estimates
- Reliance on notional data
- Limited understanding of shortfalls and bottlenecks
- Static representation

VS

NEW WAY
Execution Planning & Replanning



- Continuous parallel dynamic processing
- Highly automated
- Minutes to hours
- Real-world data tied to operational picture
- Uses execution-level data throughout
- Continuous execution monitoring & plan assessment
- Living logistics plan representation

Enabling a Revolution in the Global Logistics Business Process

Conclusion

- Agent architectures can:
  - Provide enterprise interoperability
  - Enable evolving business processes
  - Provide visibility and control of the pipeline
  - Provide an open infrastructure from which grow and evolve
  - Satisfy the vast majority of the CINC information requirements
  - Provide the foundation for secure operations over the unclassified internet

It has been demonstrated that agent-based prototypes of trusted logistics information system are capable of revolutionizing our global logistics business process

Advanced agent technology to get control of the global logistics business process...

General ALP Project Information
www.darpa.mil/iso/alp

Open Source Web Site
COGnitive Agent ARchitecture
www.cougaar.org

Protected ALP Web Site
www.advancedlogistics.isotic.org
(User ID/Password available on request)

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